Post meeting Comments from:
Lawrence Galowin
Guest Researcher
NIST
100 Bureau Drive
Gaithersburg, MD 20899
lgalowin@nist.gov

To: John Flowers
From: Lawrence Galowin
Subject: Considerations and Recommendations for Water Efficiency Rating Labeling Program

Several comments are submitted for EPA consideration applicable to development of the cited program.

1. A most significant gap at the meeting presentation is omission of the topic of specified requirements legally established in all communities for building regulatory systems which require product approvals prior to any acceptance for buildings installations. Those stipulations incorporate building codes reference to national standards for approval testing for acceptable performance in installed plumbing systems. Involved organization representatives (state officials, code developers and standards organization staff) need to meet for your briefing and discussions leading to elimination of problems that may be foreseen. EPA labels are insufficient for the means of being incorporated into acceptances under regulatory processes under current methods, although for do-it-yourself applications could suffice. The labels as applied in Energy Star or for appliances generally are applicable outside regulatory stipulations in communities and as user information generally suffices.

EPA should conduct a joint meeting of representatives from all impacted sectors involving codes and standards applications as adopted and enforced by state plumbing officials in building regulatory applications. Presentations on the planned effort are necessary in order to gain interest and support and allow adequate feedback to discuss necessary measures that could establish broad acceptances of the EPA goals, how to effectively achieve them, and fulfill regulatory requirements. NIST, with other participants, provided major assistance to Oregon for Plumbing Regulations revision for new uniform statewide acceptance practices and requirements based on applications of conformity assessments requiring recognized independence for approval processes and are now in effect. NCBCS has adopted and recommended those practices to all states. A similar action to convene at NIST the concerned representatives may be possible.

2. An almost immediate impact for consumer labeling information could be initiated. From EPA preparation and distribution to vendors supply a current listing for consumer information of tabulated water closets testing performance based on the required current standard test method (ASME A112. 19.6 and shortly forthcoming revision ASME A112.19.2) for waste solids removal test results (permissible lower allowable 75% average removal and ranges to total 100 % extraction). These data would provide consumer information in the same manner as current appliance data informs consumers of anticipated performance. Such lists should be displayed at all showrooms and vendor/suppliers. The data would come from certified copies provided by manufacturers from laboratory test reports for achieving the standards requirements (under EPACT) of fixtures placed on the market. Another benefit to EPA could result from

responses that would indicate organizations that support, or undertake difference of opinion positions, with the proposed program and help comprehend future opposition.

3. There is a need for a publication that provides a uniform economic water utility guide for evaluating impacts in financial aspects and determination of adoption for proposed activities. It was implied that water conservation must result in increased rates to consumers; that demands intensive inquiry and consistent determination methods applicable to utilities of all sizes. There appears to be an inherent contradiction in the assumption; usually lower unit costs result in with lesser production; why do negative financial outcomes result? Furthermore if reductions that can be made to eliminate or reduce broken mains or lost 'unaccounted waters' and inflows then cost reductions plus furthering water conservation could be anticipated. However, all factors need to be considered which may require added revenues and their origin, e.g., due to other plant capital costs, bonded indebtedness, energy factors and/or other utilities financial obligations. Exploration of the economies of reduced production, treatment, and variants in water processing for delivery and follow-on waste treatment is necessary with illustrated application examples applied to small, medium, and large plants. This activity looms as a factor in gaining utility interests to promoting water conservation from areas that are not desperately water short.

4. Establish teams of visiting specialist's team visits to principal sites overseas where successful methods applicable to the program have achieved desired end results. Development of reports on practices, success and/or failures and limitations from applications should be undertaken to inform EPA of accomplished or failed intentions. Such places include Australia, Japan, Hong Kong, Sweden, and Israel.

Australian ranking methods basis of implementation requires detailed understanding of the underlying principles applied in development of referenced standards for essential requirements of expected performance. The draft for ranking includes reference standards below (excerpted) without provision of any basis of establishing how acceptance determinations were achieved:

AS/NZS

1172	Water closet (WC) pans of 6/3 capacity or proven equivalent	
1172.1	Part 1:	Water closets of 6/3 capacity — Pans
1172.2	Part 2:	Water closet (WC) pans of 6/3 capacity or proven equivalent — Cisterns
2007	Performance of household electrical appliances—Dishwashers	
2007.1	Part 1:	Performance of household electrical appliances—Dishwashers — Energy consumption and performance
2040	Performance of household electrical appliances—Clothes washing machines	
2040.1	Part 1:	Performance of household electrical appliances— Clothes washing machines— Energy consumption and performance
3500	National plumbing and drainage code	
3500.1.2	Part 1.2:	Water supply—Acceptable solutions
3662	Water supply—Water efficient mains pressure shower spray heads	
3982	Urinals	
MP 52	Manual of authorisation procedures for plumbing and drainage products	

The requirements applied to development of standards need to be understood with respect to the means of formulating and specifying characteristics as well as for prescribed test procedures by evaluation techniques for statistically reproducible measurements. For example, do faucets and shower heads provide adequate flows to remove suds and how judged; or do extended times of use result so that possibly more total water consumption and inadequate satisfaction results? How were such parameters selected or determined (and means for laboratory tests under standard procedures) to provide demonstration compliance to a given ranking? The rationale for such parametric determinations usually include physical sciences and human factors for achieving acceptable minimal levels of water usage applied over the entire ranking ranges. Usually underlying laboratory test measurements apply standard testing procedures with test media for measurements/evaluations from set procedures for rejection or acceptance. Considerations applied by developers in reaching conclusions need to be determined in order to understand the processes applied for public applicability. How those attributes were studied and analyzed for applications in the standards must be evaluated. Those can only be achieved in firsthand exchanges in order to be understood. Potentials for applications to the EPA program purposes in setting acceptance performance criteria could then be determined.

Water reuse opportunities need to be backed up from actual experiences that represent useful and representative implementation over time. In particular, Japanese applications in high-rise and hotel buildings have applied reuse practices with two pipe systems and treatment methods over years of utilization. Detailed monitoring of many elements was reported (at CIB W62 – Water Supply and Drainage International Seminars) and could be indicative of practical practices for application in the U.S.

Hong Kong regulations require extreme low flush volume water closets and many regulations apply to public usage. Requirements for manufacturer compliance to rigid performance requirements should be determined and their effectiveness ascertained from the history of applications.

Swedish manufacturers have advanced low water consumption fixtures over many years. Of major importance was evolution of very low flush water closets with self siphon holding tanks in multi-family dwellings. Initial collection of solids and waste water in tanks permit initial accumulations followed by self-siphon booster action that discharges and conveys collected solid wastes with sufficient waste water for transport into the sewer systems. Potential of applicability to water short U.S. installations as conceived, or by modification to existing waste drainage systems, can provide engineered modifications for satisfactory performance since all waste waters are applied into the collection tank and achieves total system water savings. Site visits and reviews with plumbing engineers of installations would evaluate the significance for adopting the practice in the U.S. program.

Israel has historically advanced water conservation through reuse with applications to irrigation in agriculture with protective measures for farming by limitations near harvest times to provide public health safety. Detailed analyses of practices and methods adopted are worthy of consideration as input to the EPA program.

5. Water reuse in appliances incentives through an EPA award scheme for promoting useful applications to other on-demand applications from stored gray water particularly without additional processing. A potential application to in-sink-grinders for garbage disposal with stored waste waters (without a requirement for any further processing) would achieve water savings. Collected discharge outflows from latter rinse cycles of laundry machines and particularly dishwashers (usually adjacent to sinks) could flush the waste grinder and carry wastes into the

building drainage system should be a consideration for development. A multi-gallon storage tank as a part of the grinder installation need not require extensive volume for the intermittent operations necessary for grinder purposes. The need for sink faucet running water could be eliminated or severely reduced.

6. Conduct plumbing engineering drainage design studies for multi-story buildings with installations of full complement of water conserving fixtures. Undertake the efforts through the assistance of the American Society of Plumbing Engineers Research Foundation (ASPE RF) and then publication in ASPE Design Data books. An initial piping systems sizing study effort should be undertaken for mid-rise and high-rise apartments and buildings with particular emphasis on waste transport in the branch drains as well as from the building and into sewers. Apply water supply and drainage systems design based on current approximate practices and best estimates of water savings fixtures and appliances (approximations from water supply and drainage reduced Hunter fixture unit modifications). Comparative studies also should be undertaken, based on the same assumptions, but designed from the DRAINET computer program that provides exact solutions (computer numerical solutions to governing dynamic equations) for drainage systems; that accounts for all fluid and solid wastes transport dynamics applied to building drainage systems design. That computer method establishes total system parameters to assure conveyance of wastes. The need to focus on branch drains from kitchen and bathrooms where complementary flows can be minimally assisting conveying wastes into the main drainage stacks. The current program (DRAINET) was extended by United Kingdom research after early U.S. development; it is now available on computer disc for very rapid utilization. An early study of U. S. Army barracks demonstrated smaller waste drain pipe sizes and greater pipe pitch to assure waste solids carry to the sewer from the building. Conditions cannot be otherwise evaluated from any current design practice. Also elliptical drain pipe cross-sections for greater effective transport with lowered flows (shown theoretically in past studies) have been applied commercially in practice in other countries, Japan in particular. There are no other known methods for determination of drainline transport of solid wastes; confidence for avoiding drain blockages from reduced discharged volume from water closets is a primarily significant factor for widespread adoption.

7. (a) Update the solid waste transport modeling for drains correlation formulae in DRAINET computer program for plumbing drainage system design. Continuing and repeated testing efforts for laboratory test evaluation performance of water closets remains costly and time consuming and can be replaced by accurate rapid computations for any discharge flow rate profile and location of waste solids in time varying discharge profiles. Also, most testing efforts fail to include any drain line transport of solid wastes with reduced discharges. Confidence for avoiding drain blockages in drains from reduced volume water closet discharges must be assured. Current U.S. standard applies plastic balls in tests (that roll down the inclined pipe and are essentially worthless for the purpose) and leaves great confusion. Currently, predictive correlation formulae for transport have been developed and extrapolated from only one model waste solid (an NBS water filled plastic cylinder solid) but requires expansion to the many types of mixed media waste representations applied in ongoing tests and standards testing. Generalizations of additional correlation equations available are needed.

7. (b) Prepare parametric drain pipe sizing design charts that provide acceptable drainage transport for applications by design engineers and incorporation into code references for building regulatory guidelines. The parametric conditions could cover the ranges of conditions readily calculated from DRAINET for applications to low water consumption water closets and other

plumbing fixture discharges that add to the waste streams. Particular applications would refer to the branch drains that are the most at risk locations as well as the major collected building drains. Computer charts would extend the calculation procedures for methods usually practiced by engineers, applied in handbooks, and applied in code documents. Typical parameters would include pipe materials, pitch and diameter, wall roughness and material properties, and varieties of mixed media waste solids. Such tabulations and charts can be published in designers practice manuals, provide referenced documentation for building regulatory codes, and applied for on-site building inspectors' approval methods.